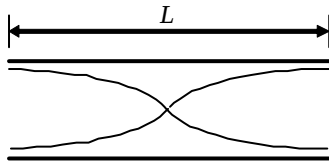


P4A

a)



harmònic fonamental: $\lambda_1 = 2L$ [0,2]

$$v = \lambda f ; f_1 = \frac{v}{\lambda_1} = \frac{v}{2L} = 243 \text{ Hz} \quad [0,2]$$

segon harmònic $\lambda_2 = L$; $f_2 = \frac{v}{\lambda_2} = \frac{v}{L} = 486 \text{ Hz}$ [0,2]

tercer harmònic $\lambda_3 = \frac{2L}{3}$; $f_3 = \frac{v}{\lambda_3} = \frac{3v}{2L} = 729 \text{ Hz}$ [0,2]

b) una flauta: $\beta_1 = 10 \cdot \log \frac{I}{I_0} = 65 \text{ dB}$ [0,2]

tres flautes: $\beta_3 = 10 \cdot \log \frac{3I}{I_0}$ [0,3]

$$\beta_3 = 10 \cdot \log \frac{3I}{I_0} = 10 \left(\log 3 + \log \frac{I}{I_0} \right) = 10 \cdot \log 3 + \beta_1 = 69,8 \text{ dB} \quad [0,5]$$

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